

Claims

- [c1] I claim a method for illuminating a scene and analyzing the reflected radiance comprising:
- (a) an illumination device having a means of generating and directing radiance toward a scene where said radiance is composed of a selective set of time sequential, spatially encoded intensity patterns where the radiance has, in addition, a resolvable temporal structure,
 - (b) a receiving device having a means of optically collecting the reflected radiance from said scene and converting said reflected radiance into an analyzable signal,
 - (c) a means of controlling and maintaining the synchronization between generation of said radiance patterns and said collected signal,
 - (d) a data processor device having a means to collect and store multiple sets of said signals,
 - (e) said data processor having in addition a program providing a means to combine various sets of signals in a prescribed manner,
- whereby a representation of said scene is determined.
- [c2] The device in claim 1 wherein the representation of said scene is a data set that can be used to render a

three dimensional model of said scene.

- [c3] The device in claim 1 wherein the representation of said scene is a data set separable into range estimations and intensity values of elements in said scene.
- [c4] The device in claim 1 wherein the representation of said scene is an array of intensity values that can be interpreted as an image.
- [c5] The device in claim 1 wherein the representation of the scene is a data set conforming to a prescribed manner of rendering an image.
- [c6] The device in claim 1 wherein said radiance source is a laser.
- [c7] The device in claim 1 wherein said radiance source is composed of multiple monochromatic sources and said scene representation includes additional spectral information.
- [c8] The device in claim 1 wherein said radiance is emitted as a pulse with a duration of about a few nanoseconds.
- [c9] The device in claim 1 wherein said radiance is a series of pulses and the pulse repetition rate changes monotonically during the interval of one pattern.

- [c10] The device in claim 1 wherein said illumination device generating the said encoded patterns selects from a set of predetermined patterns.
- [c11] The device in claim 1 wherein the set of patterns are adaptively determined concurrent with analysis.
- [c12] The device in claim 1 wherein the generating patterns that create said encoded intensity patterns are microscopic surface relief elements which impart a spatially variant phase delay to the light beam to produce calculable diffractive optical effects.
- [c13] The device in claim 1 wherein the generating patterns that create said encoded intensity patterns are microscopic spatial light modulating elements that produce calculable diffractive optical effects.
- [c14] The device in claim 1 wherein the generating patterns that create said encoded intensity patterns are holographically recorded patterns.
- [c15] The device in claim 1 wherein the generating patterns that create said encoded intensity patterns are inscribed on a surface and pivoted into position.
- [c16] The device in claim 1 wherein the generating patterns that create said encoded intensity patterns are

inscribed on a surface and translated into position.

- [c17] The device in claim 1 wherein a reconfigurable micro-structured device presents the generating patterns that create said encoded intensity patterns.
- [c18] The device in claim 1 wherein said radiance is directed toward said scene using an appropriate combination of lenses, reflectors, fiber optics, and optical elements.
- [c19] The device in claim 1 wherein the said receiver is an electro-optic device that converts radiant intensity into an electronic signal.
- [c20] The device in claim 1 wherein said receiving device has a means of conditioning said signal for improved analysis.
- [c21] The device in claim 1 wherein said illumination device and said receiver device and said data processing device are distinct and separated units.
- [c22] The device in claim 1 wherein said illumination module and said receiver device and said data processing device are combined together into a unified package.
- [c23] The device in claim 1 wherein said signals are analyzed at multiple discrete time intervals in order to

extract range estimates.

[c24] The device in claim 1 wherein said signals are mixed with the monotonically increasing pulse train in order to generate an interference signal that indicates a range estimate.